04-542

IMPLEMENTING AGREEMENT

BETWEEN

THE UNITED STATES NUCLEAR REGULATORY COMMISSION

AND

THE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE

IN

THE FIELD OF NUCLEAR REACTOR SAFETY RESEARCH

This Implementing Agreement is made between the United States Nuclear Regulatory Commission (hereinafter referred to as USNRC), and the Japan Atomic Energy Research Institute (hereinafter referred to as JAERI) which are hereinafter collectively referred to as the Parties;

Considering that the Parties:

1. Have a mutual interest in cooperation in the field of nuclear reactor safety research with the objective of improving and thus ensuring the safety of civilian nuclear installations on an international basis;

2. Recognize a need to equitably share both the resources resulting from this research and the effort required to develop those resources;

3. Have an interest in cooperating in the areas of thermal-hydraulic safety and related code development, severe accidents, plant aging, and safety of high-burnup fuel for light water reactors;

4. Recognize the Implementing Arrangement Between the Nuclear Regulatory Commission of the United States of America and the Science and Technology Agency [STA] of Japan (now the Ministry of Education, Culture, Sports, Science and Technology [MEXT] of Japan, the successor agency to the STA) for Cooperation in the Field of Nuclear Regulatory Matters and Nuclear Safety Research and Development signed on October 23, 1997, hereinafter referred to as the USNRC-MEXT Implementing Arrangement, and the extension of the USNRC-MEXT Implementing Arrangement signed on March 11, 2003, for an additional five years;

5. Recognize that the STA designated JAERI, a non-governmental institute, as its technical monitor/administrator to assist in the implementation of cooperation in the field of nuclear reactor safety research in the areas of thermal-hydraulic safety and related code development, severe accidents, plant aging, and safety of high-burnup fuel for light water reactors, in its letter dated May 29, 1998, as

acknowledged in the USNRC letter dated August 6, 1998, and that this cooperative agreement is an implementation of the USNRC-MEXT Implementing Arrangement;

The Parties have agreed as follows:

ARTICLE I - OBJECTIVE

The objective of this Implementing Agreement is to establish a general framework of cooperation in the field of nuclear reactor safety research. The Parties, in accordance with the provisions of this Implementing Agreement and subject to applicable laws and regulations in force in their respective countries, will join together for cooperative research in the field of nuclear reactor safety research sponsored by the Parties.

ARTICLE II - FORMS OF COOPERATION

Cooperation between the Parties may take the following forms:

A. The exchange of information in the form of technical reports, experimental data, correspondence, newsletters, visits, joint meetings, and such other means as the Parties agree.

B. The temporary assignment of personnel of one Party or of its contractors to the laboratory or facilities owned by the other Party or in which it sponsors research. Each personnel assignment shall be considered on a case-by-case basis and be the subject of a separate personnel assignment agreement between appropriate representatives of the recipient and assigning organizations.

C. The use, by one Party, of facilities that are owned by the other Party or in which research is being sponsored by the other Party. Use of these facilities may be subject to commercial terms and conditions.

D. If a Party wishes to visit, assign personnel, or use the facilities owned or operated by entities other than the Parties to this Implementing Agreement, the Parties recognize that prior approval of such entities will, in general, be required by the receiving Party.

E. Any other form agreed between the Parties.

ARTICLE III - SCOPE OF AGREEMENT

The Parties, in accordance with the provisions of this Implementing Agreement, will undertake a program for cooperative research in the field of nuclear reactor safety research. This cooperative program will consist of technical information exchange in the areas of:

- Thermal-hydraulic safety and related code development,
- Severe accidents,

- Plant aging, and
- Safety of high-burnup fuel for light water reactors.

The Parties will share their research results in the specific program elements outlined in Appendices A and B, which are integral parts of this Implementing Agreement. The topics and program elements outlined in Appendices A and B will be updated and adjusted periodically as the programs develop during the time this cooperation is in force.

ARTICLE IV - ADMINISTRATION OF THE AGREEMENT

A. The Parties will each designate one representative to coordinate and determine the detailed implementation of this Implementing Agreement. These representatives may, at their discretion, delegate this responsibility to the appropriate technical staff with respect to a given issue or research area. The single designated representative will be referred to as an Administrator of this Implementing Agreement.

B. Information on matters related to organization, budget, personnel, or management may be restricted and not provided as part of the general information exchange under this Implementing Agreement.

C. The Parties will endeavor to select technical personnel for assignments to these cooperative programs who can contribute positively to the programs. Technical personnel of the Parties assigned for extended periods will be considered visiting scientists within the programs in this Implementing Agreement and will be expected to participate in the conduct of the analysis and/or experiments as necessary.

D. Each Party to this Implementing Agreement will have access to all nonproprietary reports written by its partner's technical personnel assigned to the respective programs that derive from its participation in those programs.

E. Administrative details concerning questions such as security, indemnity, and liability related to the assignees or trainees will be addressed in personnel assignment agreements between the respective Parties.

F. Travel costs, living expenses, and salaries of visiting technical personnel or personnel participating in program review meetings will be borne by their respective organizations.

ARTICLE V - EXCHANGE AND USE OF INFORMATION AND INTELLECTUAL PROPERTY

The Parties support the widest possible dissemination of information provided or exchanged under this Implementing Agreement, subject to the need to protect proprietary or other confidential or privileged information. The exchange and use of information provisions contained in Article III of the USNRC-MEXT Implementing Arrangement and the Annex, "Protection and Distribution of Intellectual Property Rights and Other Rights of a Proprietary Nature," will govern this Implementing Agreement.

ARTICLE VI - FINANCIAL CONSIDERATIONS

A. All costs arising from implementation of this Implementing Agreement will be borne by the Party that incurs them except when specifically agreed to otherwise. It is understood that the ability of the Parties to carry out their obligations is subject to the availability of funds. It is also understood that the terms herein agreed to represent feasible commitments according to the Parties' best understanding regarding resources and costs at the time of signature.

B. JAERI will make technical in-kind contributions to the USNRC in the field of nuclear reactor safety research as described in Appendix B.

C. USNRC will make technical in-kind contributions to the JAERI in the field of nuclear reactor safety research as described in Appendix A.

ARTICLE VII - DISPUTES, WARRANTY OF INFORMATION, AND LIABILITY

A. Information furnished by one Party to the other Party under this Implementing Agreement will be accurate to the best knowledge and belief of the Party supplying the information. However, the application or use of any information exchanged or transferred between the Parties under this Implementing Agreement will be the responsibility of the Party receiving the information, and the transmitting Party does not warrant the suitability of the information for any particular use or application

B. Cooperation under this Implementing Agreement will be in accordance with the laws and regulations of the respective countries. Any dispute or questions between the Parties concerning the interpretation or application of this Implementing Agreement arising during its term will be settled by mutual agreement of the Parties.

C. Neither Party makes any warranties, whatsoever, for the ability or suitability of its codes or its other analytical techniques to perform in any particular manner for any particular purpose or to accomplish any particular task.

D. Neither Party accepts liability for damages of any type that may result from the use of its codes or other analytical techniques provided under this Implementing Agreement.

E. Each Party shall be responsible for accidents to its staff or damages to its property regardless of where the damages have been incurred, and shall not bring suit or lodge any other claims against the other Party for damages to its property or accidents to its staff, unless that claim is based on gross negligence or intentional misconduct of the other Party.

ARTICLE VIII - OTHER CONSIDERATIONS

A. All USNRC and JAERI computer codes disseminated under this Implementing Agreement are to be considered privileged information unless otherwise noted, are protected as such by USNRC and JAERI respectively, and shall be treated likewise by the Parties. They are, in particular, subject to all the provisions of this Article including

the requirements for an agreement of confidentiality (Article V) prior to dissemination, with the exception that they need not be marked with the restrictive designation. The codes are subject to this protection in both object and source forms and as recorded in any media.

B. USNRC and JAERI codes and other related analytical techniques covered under this Implementing Agreement and any improvements, modifications or updates to such codes or techniques, are for the purpose of reactor and plant systems safety research and licensing and will not be used for commercial purposes, or for other benefits not related to the study of reactor safety without the prior consent of USNRC or JAERI as appropriate.

Among the code uses that will be permitted under this Implementing Agreement are those related to research in the reactor safety area and analyses performed by the Parties or their contractors that can assist regulators and plant personnel in assessing the safety of the plant, analyzing operating events, and training of operators. Specific examples of permitted analyses include: design basis accidents (e.g., loss-of-coolant-accidents), anticipated transients, accident management and emergency operating procedures, mid-loop operation, analyses to support PRA success criteria, power uprates and reload.

Prohibited uses of USNRC codes include: (1) analyses to develop a new reactor design and (2) analyses to support power upgrades and reload in the U.S. unless performed by a U.S. subsidiary.

Prohibited uses of JAERI codes include: (1) analyses to develop a new reactor design and (2) analyses to support power upgrades and reload in Japan unless performed by a Japanese subsidiary.

C. USNRC and JAERI codes and other related analytical techniques will not be advertised directly or by implication to obtain contracts related to the construction or servicing of nuclear facilities, nor will advertising imply that USNRC or JAERI has endorsed any particular analyses or techniques.

D. All reports published within the scope of this Implementing Agreement and all meetings held will be in English.

ARTICLE IX - FINAL PROVISIONS

A. This Implementing Agreement will enter into force upon signature, will remain in force for a period of five years, and may be amended or extended by mutual agreement of the Parties, provided that the USNRC-MEXT Implementing Arrangement remains in force.

B. The Parties have the right to utilize information provided under this Implementing Agreement after the expiration date. However, all information protected by provisions of this Implementing Agreement as proprietary, confidential, privileged, or otherwise subject to restriction on disclosure will remain so protected indefinitely unless mutually agreed otherwise in writing.

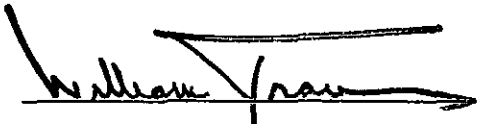
C. Either Party can withdraw from the present Implementing Agreement after providing the other Party a written notice at least 180 days prior to its intended date of withdrawal. The Party not withdrawing shall reserve the right to determine if the withdrawal will result in the other Party receiving a disproportionate share of the expected benefit from this Implementing Agreement. If so, both Parties will endeavor to reach an equitable settlement of the matter through negotiation.

D. The Parties to this Implementing Agreement reserve the right to modify or extend the specific activities described in Article III within the intended scope of the Implementing Agreement upon written concurrence of their Administrators.

E. If the portion of the research program of any Party that is pertinent to this Implementing Agreement is substantially reduced or eliminated, the technical scope described in Article III may be adjusted to substitute research of equivalent programmatic interest upon mutual agreement of the Parties.

IN WITNESS WHEREOF, the Parties have signed the present Implementing Agreement.

FOR THE UNITED STATES NUCLEAR REGULATORY COMMISSION:

BY: 

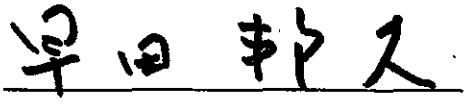
NAME: William D. Travers

TITLE: Executive Director for Operations

DATE: August 12, 2003

PLACE: Rockville, Maryland, U.S.A.

FOR THE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE:

BY: 

NAME: Kunihisa Soda

TITLE: Executive Director

DATE: September 3, 2003

PLACE: Kashiwa, Chiba, Japan

APPENDIX A

USNRC NUCLEAR REACTOR SAFETY RESEARCH PROGRAM ELEMENTS

THERMAL-HYDRAULIC (T-H) SAFETY AND RELATED CODE DEVELOPMENT

Experimental Data

- Experiments on interfacial area transport in vertical and horizontal pipes at Purdue University and University of Wisconsin, respectively
- Rod bundle heat transfer program to develop new reflood model at Pennsylvania State University.
- Integral Effect Tests (IET) and Separate Effect Tests (SET) for boron mixing at University of Maryland
- PUMA experiments for two-phase flow instability, choked flow and non-condensable gas stratification in containment at Purdue University
- Steam/water phase separation experiments in piping tees at Oregon State University

T-H System Code Development and Improvement

- TRAC-M code with parallel processing, boiling water reactor (BWR) capability, semi-implicit numerics, exterior communications interface, and coupling to CONTAIN code
- RELAP5/MOD3.3 code with new steam tables, graphical user interface post- and pre-processor, automated code assessment program and automated developmental assessment script capability
- Development and verification of thermal-fluid code for high temperature gas-cooled reactor (HTGR)

Neutronics

- New version of PARCS code for mixed oxide (MOX) fuel with Automatic Mapping Method and improved coupling strategy
- Spatial lattice NEWT code
- Development and verification of neutronics codes for HTGR

SEVERE ACCIDENTS

- Development of integral severe accident analysis code MELCOR
- SCDAP/RELAP5 code analysis for steam generator tube integrity under severe accident conditions
- Severe accident analyses to quantify risk for risk-informed 10 CFR Part 50
- Experimental data and analysis methods for source term including severe accidents for HTGR

PLANT AGING

Aging Evaluation

- Aging evaluation of reactor pressure vessel (RPV) including re-evaluation of technical basis for pressurized thermal shock (PTS) rule
- Experiments and modeling on irradiation effects in RPVs at Oak Ridge National Laboratory (ORNL)
- Aging evaluation of core internals including verification of analytical methods for crack initiation and growth for irradiation assisted stress corrosion cracking (IASCC), and guidance for mitigating cracking
- Experiments and modeling on IASCC at Argonne National Laboratory (ANL)
- Aging evaluation of concrete structures, especially steel liners and concrete in inaccessible areas
- Aging evaluation of electrical cables, especially on the degradation of insulation and flame retardancy
- Development of non-destructive aging monitoring techniques
- Experimental data and analysis methods for high-temperature metallic components and nuclear graphite

Component Reliability Evaluation

- Development and assessment of probabilistic fracture mechanics code FAVOR and its application to nuclear power plants (NPPs)
- Development of methodology for seismic margins
- Ranking of seismic risk significance for structures/components (e.g., masonry walls, tanks, anchorages, concrete structures [other than containment], buried piping and supports for equipment)

Other

- Instrumentation and Controls - New technologies

SAFETY OF HIGH-BURNUP FUEL FOR LIGHT WATER REACTORS (LWRs)

Reactivity-Initiated Accident (RIA) and BWR Power Oscillations

- FRAPTRAN code development and assessment at Pacific Northwest National Laboratory (PNNL)
- Studies and calculations of RIAs in pressurized water reactors (PWRs) at Brookhaven National Laboratory (BNL)
- BWR power oscillation calculations at BNL
- Cladding mechanical tests at ANL and at Pennsylvania State University (PSU)

Loss-of-Coolant Accident (LOCA)

- Thermal shock (quench) tests with irradiated fuel cladding at ANL
- Cladding oxidation test at ANL

Normal Operation and Abnormal Transients

- FRAPCON-3 code development and assessment at PNNL
- Analysis of operational events

Spent Fuel Shipping and Storage

- Burnup credit calculations and criticality studies at ORNL
- Measurements of isotopic contents of high-burnup fuels at ANL
- Long-term creep tests for dry storage conditions at ANL

APPENDIX B

JAERI NUCLEAR REACTOR SAFETY RESEARCH PROGRAM ELEMENTS

THERMAL-HYDRAULIC (T-H) SAFETY AND RELATED CODE DEVELOPMENT

Large Scale Test Facility (LSTF) Experiments for Existing Light Water Reactors (LWRs)

- Accident management measures for prevention of severe core damage
- Loss of residual heat removal (RHR) during mid-loop operation
- Natural circulation of superheated vapor
- Primary system cooling by secondary side depressurization
- Critical flow measurements for break flow or flow through a power operated relief valve (PORV)

LSTF Experiments for Advanced LWRs with Passive Safety Systems

- Long term decay heat removal (low pressure natural circulation, non-condensable gas behavior)
- Primary system depressurization
- Core makeup
- Passive containment cooling using a horizontal U-tube condenser

Separate Effects Experiments

- Thermal stratification in cold leg and vessel
- Condensation-induced water hammer
- Interfacial area transport in large vertical pipe

Experiments for T-H and Neutronics Coupling (THYNC) Events

- Boiling water reactor (BWR) instability with and without scram

T-H Computer Code Development and Improvement

- RELAP5/MOD3 code validation and model development
- Three dimensional T-H and neutronics coupling code TRAC/SKETCH
- Mini-TRAC (simplified TRAC code)
- Improvement of core thermal-hydraulic code FLOWNET and plant dynamics analysis code ACCORD for HTGR

Other

- HTGR Neutronics data obtained in the High-Temperature Engineering Test Reactor(HTTR)

SEVERE ACCIDENTS

Source Term Studies

- VEGA program for radionuclide release from irradiated fuel under high temperature and high pressure conditions
- ART code for fission product transport
- Experimental data and analysis methods for source term including severe accidents for HTGR

Ex-vessel Phenomena Studies

- CAMP code for debris coolability
- JASMINE code for fuel-coolant interactions (FCI)
- FCI experiments
- Analysis of fission product behavior in containment
- Severe accident management analysis

PLANT AGING

Aging Evaluation

- Aging evaluation of reactor pressure vessel (RPV) including toughness degradation of RPV and overlay clad materials due to neutron irradiation
- Aging evaluation of core internals and development of prediction methods for crack initiation and growth due to irradiation assisted stress corrosion cracking (IASCC)
- Aging evaluation of concrete structures including steel liners such as experimental assessment of thermally and/or irradiation induced degradation
- Aging evaluation of electrical cables including development of prediction methods for long-term degradation based on accelerated tests and that of non-destructive degradation monitoring methods
- Development of non-destructive degradation monitoring techniques, especially for irradiation embrittlement of RPV materials
- Experimental data and analysis methods for high-temperature metallic components and nuclear graphite

Component Reliability Evaluation

- Probabilistic fracture mechanics code PASCAL and its application to a model plant
- Seismic fragility data
- Seismic hazard assessment techniques
- Seismic and structural analyses in HTTR design

Other

- Instrumentation and Controls - New technologies

SAFETY OF HIGH-BURNUP FUEL FOR LIGHT WATER REACTORS

Reactivity-Initiated Accident (RIA)

- NSRR experiments with high-burnup UO_2 and mixed oxide (MOX) fuels for LWRs (transient data and post-test fuel examination data)
- NSRR experiments with unirradiated fuels to be performed as separate-effect tests for high-burnup fuels
- Measurements of cladding mechanical properties including those in tube burst test and modified ring tensile tests
- Code analysis and model development

Loss-of-Coolant Accident (LOCA)

- Integral thermal shock (quench) tests with unirradiated and irradiated fuel cladding
- Cladding oxidation tests
- Cladding burst tests
- Code analysis and model development

Normal Operation and Abnormal Transients

- Post-irradiation examinations on high-burnup fuels
- FEMAXI code development and assessment

Spent Fuel Shipping and Storage

- Burnup credit calculations
- Spent Fuel Composition (SFCOMPO) database for spent fuel isotopic components